भारतीय मानक
Indian Standard

IS 16175 : 2014
(Reaffirmed 2019)

आवधिक निरीक्षण एवं पुनः अर्हता — वाहनों के प्रयोग के लिए द्रवित पेट्रोलियम गैस (एलपीजी) सिलिंडर — रीति संहिता

Periodic Inspection and Requalification — Liquefied Petroleum Gas (LPG) Cylinders for Automotive Use — Code of Practice

ICS 23.020.30; 43.060.40; 75.160.30

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March 2014 **Price Group 7**

Gas Cylinders Sectional Committee, MED 16

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Gas Cylinders Sectional Committee had been approved by the Mechanical Engineering Division Council.

This standard provides information and procedure for the periodic inspection of liquefied petroleum gas (LPG) containers used as a fuel for automotive vehicles. These containers, installed in vehicles are certified by the manufacturer to meet the requirements of relevant standard and are designed to store LPG.

Containers undergo cyclic loading and it is imperative that due importance and care shall be taken during its life cycle. Container contains high energy contents due to gas in it which makes the safety concern and therefore, compliance with the requirements and following the detailed procedures listed in the standard are of upmost importance.

These containers are certified by the manufacturer for the storage of LPG. Containers for storage of LPG are required to maintain or improve the level of safety currently existing in practice. These requirements are achieved by following the procedures listed in the standard.

While implementing this standard compliance with statutory regulations shall be ensured.

The composition of the Committee responsible for the formulation of this standard is given in Annex E.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

PERIODIC INSPECTION AND REQUALIFICATION — LIQUEFIED PETROLEUM GAS (LPG) CYLINDERS FOR AUTOMOTIVE USE — CODE OF PRACTICE

1 SCOPE

This standard specifies the requirement for periodic inspection and testing of auto LPG containers to verify the integrity of such gas containers to be reintroduced into service for further period of time.

This standard deals with liquefied petroleum gas containers intended for on-board storage of liquefiable petroleum gas (LPG) as a fuel, intended to be permanently fixed to the automotive vehicle.

This standard does not apply for periodic inspection and testing of composite containers.

2 REFERENCES

The following standards contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
5 : 1978	Colours for ready mixed paints and enamels
5844 : 1970	Recommendations for hydrostatic stretch testing of compressed gas cylinders
7241 : 1981	Glossary of terms used in gas cylinder technology
8868 : 1988	Periodical inspection interval for gas containers in use
9121 : 2005	Inspection gauges for checking type 1 (size 2) taper threads of gas cylinder valves, taper 1 in 16 — Specification (*first revision*)
9122 : 2008	Inspection gauges for checking type 2 taper threads of gas cylinder valves, taper 3 in 25 — Specification (*first revision*)
14899 : 2000	Liquefied petroleum gas (LPG) containers for automotive use — Specification
15100 : 2001	Multifunction valve assembly for permanently fixed liquefied petroleum gas (LPG) containers for automotive use valve for auto LPG containers
IS/ISO 9001 : 2008	Quality management systems — Requirements

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 7241 and the following shall apply.

3.1 Abrasion — Damage to container or equipment caused by wearing, grinding or rubbing away of material by friction.

NOTE — Abrasion can be the result of many cycles of something rubbing lightly on the surface of the container or equipment, or due to a few cycles, perhaps only one, of heavy rubbing.

3.2 Competent Authority — Any national body or authority designated or otherwise recognized as such for any purpose in connection with this standard.

3.3 Competent Person — Person who by a combination of training, experience and supervision is able to make objective judgments on a subject, authorized by the competent authority.

3.4 Periodic Inspection — Activities carried out at defined intervals or earlier when necessary, including but not limited to examining, measuring, testing or gauging the characteristics of a container and comparing these with specified requirements as defined in the container design standard and marking to attest conformity with the standard.

3.5 Test Station — Place where containers are tested and periodically inspected, approved by the competent authority.

3.6 Tare Weight — Sum of the empty weight, the weight of the valve including a dip tube where fitted and the weight of all other parts that are permanently attached to the container such as fixed valve protection ring/guard/foot-ring, etc.

3.7 Pit — Local corrosion not in excess of 6 mm diameter and occurring not more frequently than one in any 500 mm^2 of the surface.

4 APPROVED TESTING STATION AND PERIODIC INSPECTION INTERVAL

4.1 All inspection and tests shall be carried out at authorised station complying with the requirements of this standard and approved by the competent authority. The inspection tests shall be carried out only by competent and authorized person.

Any testing station desiring to obtain recognition for periodic testing and examination of containers shall provide the facilities listed in Annex A. Additional testing facility if any shall be provided as per the requirement of the competent authority.

4.2 Intervals between Periodic Inspection and Test

All containers are required to be inspected and tested at interval of 5 years or the interval in accordance with the requirements in IS 8868 or as approved by the statutory authority throughout their life. The shortest of the specified interval shall be applicable.

Copies of the original inspection and tests shall be checked to ensure that the container complies with the approved design and that the retest results are in line with those obtained at the time of manufacture and that there is no departures except than what is laid down in this standard.

Subsequent periodic inspections and tests shall be carried out to ensure that the container is fit for further service.

4.3 Date of First Retest

A container shall be due for a periodic inspection and test before the first retest starts from the date of manufacture. Any practice of re-stamping the unused containers with a new date at the time of their sale is not permitted.

5 LIST OF PROCEDURES FOR PERIODIC INSPECTION AND TEST

Each container shall be submitted to periodic inspection and test. The following procedures form the requirements for such inspection and test:

a) Identification of container and preparation for inspection and test (*see* **6**);
b) Release of gas and de-valving procedure (*see* **7**);
c) External visual inspection (*see* **8**);
d) Internal visual inspection (*see* **9**);
e) Tare weight verification (*see* **10**);
f) Segregation of containers (*see* **11**);
g) Hydrostatic test (*see* **12**);
h) Inspection of valve and pressure relief device and then fixing of valve (*see* **13**);
j) Pneumatic test (*see* **14**);
k) Rejection and rendering container unserviceable/De-shaping (*see* **15**);
m) Retest marking (*see* **16**);
n) Painting (*see* **17**); and
p) Test report format (*see* **18**).

It is recommended that the above listed procedures be performed in the sequence. In particular, the check of internal condition (*see* **9**) shall be carried out before the pressure test (*see* **12**).

Containers that fail an inspection or test shall be declared unserviceable. Where a container passes the previously listed procedure, but when the condition of the container remains in doubt, additional tests or methods of examination may be applied to confirm its suitability for continued service or the container shall be rendered unserviceable. Only when all doubts are eliminated, container shall be further processed.

Depending on the reason for the rejection, some containers may be repaired.

Mechanical properties of steel containers may be affected by heat exposure. Therefore, the maximum temperature for any operation shall be limited according to the manufacturer's recommendation. The heat treated containers shall never be heated above temperature of 300°C for a period exceeding 1 h.

Containers showing evidence of fire or excessive heat exposure shall be declared unserviceable and shall be destroyed as per the procedure. Fire damage may be evident by discoloration, darkening, charring or sooting of the surface in the area of exposure of container surfaces.

6 IDENTIFICATION OF CONTAINER AND PREPARATION FOR INSPECTION AND TEST

6.1 Container Removal

The container shall be removed from the vehicle prior to any inspection and testing. Removal and reinstallation of the container shall be carried out in accordance with the technical requirements of Automotive Industry Standard and/or the requirements of the relevant agencies.

The removal and re-installation shall be carried out only by competent person.

6.2 Before any work is carried out, relevant container data and its ownership shall be identified and recorded.

7 RELEASE OF GAS

All containers shall be presumed to contain gas under pressure and following precautions shall be observed.

a) The gas from the container shall be released in a safe manner keeping in mind dangers associated with the liquefied petroleum gas. Containers shall be emptied at stations at the designated area approved by competent authority only;

b) Fencing shall be provided to prevent access of unauthorised person in the LPG unloading area. The minimum clearance between the fence and the evacuation vent shall be 30m as per the layout approved by competent authority;

c) In case of degassing by water, the water shall be retained for not less than 1 h to ensure that the container is degassed. After emptying out the water, containers shall be kept in inverted position and be tapped gently by non-metallic hammer to remove dust, rust or any loose remnants in the container. After degassing the inside of LPG container shall be checked by explosive meter to ensure that the container is gas free;

d) A powder type extinguisher with a rating not less than 40 B should be located in the decanting area; and

e) A warning notice reading — 'FLAMMABLE GAS — NO SMOKING OR NAKED FLAMES' should be displayed as closely as practicable to the decanting point.

8 EXTERNAL VISUAL INSPECTION

8.1 Preparation for External Visual Inspection

The container shall be cleaned and have all loose coatings, corrosion products, tar, oil or other foreign matter removed from its external surface by one of the following methods:

a) Wire brushing;

b) Shot blasting;

c) Water jet abrasive cleaning;

d) Chemical cleaning; and

e) Other suitable methods.

The method used to clean the container shall be validated and controlled process. Care shall be taken at all times to avoid damaging the container or removing excess amounts of material of container wall thickness. If there is any plastic or insulation sticking on the surface it shall be removed. The container valve opening shall be suitably plugged to prevent entry of water or foreign particle into the containers.

NOTE — Any operation that could result in loss of wall thickness to below minimum design wall thickness shall be completed before the inspection and testing procedure.

8.2 Inspection Equipment and Method of Measurement

The external surface of each container shall then be inspected for,

a) dents, cuts, gouges, bulges, cracks, laminations or excessive base wear (*see* Table 1);

b) heat damage, torch or electric arc burns (*see* Table 1);

c) corrosion (*see* Table 2); and

d) integrity of all permanent attachments.

The rejection criteria shall be as laid down in Annex B. Containers no longer suitable for future service shall be rejected and rendered unserviceable. The inspection shall be carried out in a well illuminated area. Magnifying glass may be employed to detect cracks. Any surface coating that may obstruct optimum visual inspection shall be removed.

8.3 Gas Leak

When a leak is suspected, the container shall be pressurized to 2 MPa and submerged in a water-bath or soapy water shall be applied to the area of the suspected leak. Areas around the base shall be particularly checked. Containers found leaking shall be rejected and declared unserviceable.

9 INTERNAL VISUAL INSPECTION

After degassing, containers shall be inspected internally. Before starting the internal inspection the containers shall be cleaned internally to remove rust or foreign matter under closely controlled conditions by one of the following methods:

a) Wire brushing;

b) Shot blasting;

c) Water jet abrasive cleaning;

d) Chemical cleaning;

e) Burn out treatment in a furnace at 300ºC for a period not exceeding 1 h; and

f) Other suitable methods.

The method used to clean the container shall be validated and controlled process. Care shall be taken to avoid damaging the container or removing excess amounts of container wall thickness. Any internal liner or coating that may obstruct optimum visual inspection shall be removed.

In determining the condition of container, the examiner shall take into consideration its minimum wall thickness required by the specification to which the container was made.

Each container shall be inspected internally using adequate illumination to identify any defects similar to those listed in **8.2** (a) and **8.2** (c). Precaution shall be taken to ensure that the method of illumination presents no risks to the operator performing the operation.

The container shall be declared unserviceable where a defect exceeding the limits specified in **8.2** is detected or the bottom of an internal defect cannot be seen and its extent cannot be measured.

9.1 Threads and Sealing Surfaces

Where fittings have been removed to allow inspection of the container, both the fittings and container shall be examined. The following requirements apply:

a) The container shall be declared unserviceable where examination of the threads shows damage or excessive wear except where gauging shows the threads to be satisfactory;
b) Where threads are cleaned using an appropriate tap, if any significant metal removal has taken place, container shall be declared unserviceable except where gauging shows the threads to be satisfactory;
c) Cracks manifest themselves as lines that run vertically down the thread and across the thread faces. They shall not be confused with tap marks (thread machine stop marks). Special attention shall be paid to the bottom of the threads; and
d) Threads shall be checked with 'GO' or 'NO GO' gauges. Thread gauges shall comply with IS 9121or IS 9122 as applicable.
e) The container shall be declared unserviceable where sealing face including the O-ring groove show evidence of corrosion, or other damage, which would affect the integrity of the seal; and
f) Faulty fittings shall be replaced with appropriate and authorized fittings and records for the same shall be maintained.

10 TARE WEIGHT VERIFICATION

After degassing and thorough cleaning (internally as well as externally), each container shall be checked for correct determination of the tare weight.

The tare weight of the containers shall be determined by weighing on a scale calibrated with traceability to national or international standards. The weigh scale shall be checked for accuracy on a daily basis. The capacity of weighing scale shall be suitable for the tare weight of the appropriate containers.

Tare weight of the cyinder shall be compared with the original tare weight punched on the container and that mentioned in the certificate. Any container which loses in its tare weight by over 5 percent shall be declared unserviceable. Records of tare weighment shall be maintained.

11 SEGREGATION OF CONTAINERS

Containers on the basis of inspection shall be segregated as unserviceable or repairable.

11.1 Unserviceable

Containers with any one or more of the following conditions shall be declared unserviceable:

a) Containers declared unserviceable when inspected according to **8**, **9** and **10**;
b) Containers having lost their identity (Manufacturer's name, serial number of the container, test date and original tare weight);
c) Containers coming for repairs for the second time; and
d) Containers having wall thickness less than the minimum design thickness.

Cause(s) of rejection of all the unserviceable containers shall be recorded in the test report format as shown in Annex C and cause may be standard in the following manner:

Bulge : F-1
Burn : F-2
Dent : F-3
Dig : F-4
Cut : F-5
Pit : F-6
Line corrosion : F-7
General corrosion : F-8
Bung thread damage : F-9
Loss in tare weight : F-10
Identity lost : F-11
Container identified as once repaired : F-12
The wall thickness has reduced below minimum design thickness : F-13

11.2 Serviceable

Containers which are found serviceable according to **8** and **9** shall be taken for further processing and reconditioning and records shall be maintained.

11.3 Containers with following type of defects shall be permitted for repairs:

a) Damaged valve protecting ring/shroud may be replaced or repaired; and

b) *Dent* — De-denting of containers, if required shall be done by a process approved by the statutory authority.

11.3.1 All the hot worked or cold worked containers shall be normalized or stress relieved suitably.

12 HYDROSTATIC TEST

Each container shall be subjected to hydrostatic test. During the hydrostatic test, the pressure shall be increased gradually till the required test pressure is reached. After the test pressure is reached, the external surface of the container is dried; the pressure shall be retained for a period of not less than 60 s. Any reduction in pressure noticed during this retention period or any leakage, or visible bulge of deformation shall be treated as a case of failure in the test and the container shall be declared unserviceable.

12.1 The value of hydrostatic test pressure for LPG shall be taken as 3 MPa as specified in IS 14899. Hydrostatic test shall be carried out in according to **10.3** of IS 14899.

13 FIXING OF VALVE

13.1 Drying and Cleaning

The interior of each container shall be thoroughly dried by a suitable method at a temperature not exceeding 300°C immediately after hydraulic pressure testing, so there is no trace of free water. The interior of the container shall be inspected to ensure that it is dry and free from any contaminants. Immediately after this operation the interior of the container shall be sprayed with an approved oil based corrosion inhibitor which is compatible with LPG, so that harmful combination of the gas does not result.

13.2 Inspection of Valves and Pressure Relief Device

If valve or any other accessory is to be introduced into service, it shall be inspected and maintained to ensure that it shall perform satisfactorily in service and meet the requirements of gas tightness as per valve IS 15100 or any standard approved by statutory authority. Suitable method for inspection of Pressure Relief Device (PRD) is given in Annex D.

13.3 Prior to fixing of valves on to the container flange threads shall be cleaned using appropriate tap and checked for any imperfections, distortion, etc. Valves shall be fitted using new high tensile screws or as recommended by valve manufacturer. A suitable jointing material shall be used between the valve and flange to arrest leakage of LPG through this joint.

14 PNEUMATIC TEST

14.1 Each container after it has been dried and fitted with valve shall be tested for leakage by subjecting to air pressure of not less than 2 MPa for a period of 1 min while immersed in water and shall show no leakage from the body of the container and the joint between valves and bung. This test may be carried out after fixing the safety cap on the valve fittings as applicable.

14.2 Pneumatic leakage test shall be carried out according to **10.4** of IS 14899.

NOTE — Take appropriate measures to ensure safe operation and to contain any energy that may be released during the hydraulic test. It should be noted that pneumatic pressure test requires more precautions than water pressure test since, regardless of the size of the container; any error in carrying out this test is highly likely to lead to a rupture under gas pressure. Therefore these tests should only be carried out after ensuring that the safety measures satisfy the safety requirements.

14.3 Any container found leakage from the body or weld joint shall be rejected and rendered unserviceable.

15 REJECTION AND RENDERING CONTAINER UNSERVICEABLE/DE-SHAPING

Any container which is declared unserviceable either due to failure to pass periodic inspection or test or loss in its tare weight by over 5 percent or for any other defect found to be unsafe for use or after expiry of the service life of the container shall be destroyed by any of the following ways under the supervision of inspecting authority and under the intimation to the container owner:

a) Flattening/de-shaping;

b) Cutting into pieces in such a manner that the pieces cannot again be joined together by welding or otherwise to form a container; and

c) By crushing until the sides meet.

Records of all such containers shall be maintained and a certificate indicating rejection with reasons shall be issued.

15.1 Disposal of Rejected Containers

The following guidelines shall be adhered to,

a) owner's information shall be noted down before rendering a container unserviceable;

b) keep failed containers in a secure place, away from the testing area for a minimum of four weeks, unless the reason for failure is obvious; and

c) no unserviceable container shall be returned to the owner without de-shaping (*see* **15**).

15.2 Retesting of Rejected Container

A container that fails the inspection and test shall be condemned without retesting, except as covered below. In general the equipment and procedures of the testing station should make a retest unnecessary.

If the tester believes that a fault in his equipment or procedure may have invalidated a test result, then the container should be retested once the fault has been corrected. Records of retesting of such rejected containers shall be maintained.

NOTE — A container should not be subjected to its test pressure more than once in any 24 h period.

16 RETEST MARKING

16.1 Retest Date and Retester Symbol

The retest date is the date of the present test, which shall be indicated by the year and month. The retester symbol is the symbol of the test station.

16.2 Marking

After satisfactory completion of the periodic inspection and tests, each container shall be permanently marked at marking plate fixed on the container or at appropriate place below the original stamp marking or retest stamp marking, provided space is available or fixing a metallic plate on the container. Following shall be marked:

a) Name/symbol of retesting station;
b) Month and year of retest date: mm/yyyy;
c) Month and year next due date for retest: mm/yyyy; and
d) New tare weight of container, in kg.

Other systems of identification marking may also be used after getting approval from statutory authority.

17 PAINTING

Containers requiring repainting shall be painted as per the requirements of IS 14899. Plastic coating may also be re-applied. Paint or coating shall be applied in such a manner that all markings stamped on the marking plate fixed with the container remain legible.

18 TEST REPORT FORMAT

A record of container shall be maintained for all tests, reconditioning and inspections at the container re-tester's works and copies shall be made available to the inspecting authority and to the owner of the container, if desired. A test certificate duly approved and signed by the repairer and the inspecting authority shall be forwarded to the statutory authority and the owner of the container. A sample format is as per Annex C. A copy of test certificate shall be retained by the repairers for a period not less than 6 years.

ANNEX A

(*Clause* 4.1)

FACILITIES REQUIRED FOR CONTAINER TESTING STATIONS

A-1 MANAGEMENT

A-1.1 General Requirements

Personnel, organization, equipments, inspection procedures, recording of container data and test data shall be adequate and satisfactory. The test station shall be operated with safe operating conditions. The systems and procedures shall ensure that containers, which fail to meet the requirements and intent of these rules, are duly identified and is ensured that same are not returned into normal service. All personnel shall fully recognize their individual responsibilities and that the minimum inspectional requirement shall not be lowered for any reason, whatsoever.

NOTE — The area of responsibility shall be divided into three separate functions as indicated below. The numbers of personnel employed shall, however, be related to the quantum of work.

A-1.2 Manager

The manager responsible for the working of the test station shall be adequately qualified; his qualifications shall include training on the dangers associated with gas containers, purpose of inspection, test methods, equipment, test requirements, and recording of test results, and safety hazards associated with the gas containers and their retesting. He shall be a graduate in Mechanical or Chemical Engineering with at least 3 years of experience in the examination and testing of gas containers. He shall also be conversant with the Standards, Specifications and/or Regulations applicable to the Auto LPG containers for which the test station is approved.

A-1.3 Supervisor

The supervisor shall possess the following qualifications:

a) He shall be a science graduate or diploma in Mechanical or Chemical Engineering with at least three years experience in the examination and testing of gas containers; and
b) He shall be conversant with these rules, standards, specifications and/or regulations applicable to the auto LPG containers for which the test station is approved.

A-1.4 Operator

Personnel conducting inspections and tests shall have qualifications and experience suitable for the work on which they are engaged. They shall be trained to understand the dangers associated with LPG containers and the purpose and method of inspection.

A-2 EQUIPMENT

A-2.1 Type of Equipment

The test station shall have adequate equipment to carry out inspection and testing of LPG containers as required under these rules. It shall contain,

a) one set of these rules, standards, specifications and/or regulations applying to the auto LPG containers, which the test station is authorised to test. All these rules, standards, specifications and/or regulations shall be maintained with all current amendments;
b) fenced area having arrangement for unloading/de-gassing the containers;
c) hydrostatic test apparatus comprising pressurizing equipment, pressure gauge and volumetric measuring equipment in accordance with IS 5844. The apparatus shall be equipped with at least two 15 cm diameter (minimum) working pressure gauges. Pressure gauge shall be capable of reading to within 1 percent of the test pressure for pressures up to and including 15kgf/cm^2 and within 2 percent for pressures above 15 kgf/cm^2. It shall be tested at regular intervals and in any case not less frequently than once in a month. It shall have accuracy of ±0.5 percent;
d) non-destructive testing facilities like ultrasonic flaw detection, etc, for detection of stress corrosion cracks developed during the service, and minimum wall thickness of the container;
e) dead-weight pressure gauge tester of appropriate pressure range or a master pressure gauge of 15 cm. minimum diameter covering the appropriate pressure range. Pressure gauge shall be capable of reading to within 1 percent of the test pressure for pressures up to and including 15 kgf/cm^2 and within 2 percent for pressures above 15 kgf/cm^2. It shall be tested at regular intervals and in any case not less frequently than once in a month. It shall have accuracy of ± 0.5 percent. Master pressure gauge shall be calibrated from a NABL accredited laboratory;
f) boroscope, extra-low voltage lamps (6 or 12 V considering human safety) to permit adequate internal viewing of containers and other lamps necessary for close examination of external surfaces;
g) straightedges, templates, steel scale, vernier caliper, miscellaneous tool and ‘q’ gauges for measurement;
h) thread gauges, taps for cleaning threads, and to correct slightly damaged threads, if any;
j) weighing equipment;
k) one set of standard test weights for daily calibration of the weighing machine, stamped by the relevant statutory authority;
m) adequate container handling equipment;
n) adequate water storage and container draining equipment;
p) Facilities for internal drying of containers.(electrical heater for compressed air line is recommended. Blowers are not useful for this purpose.); and
q) Stamps for marking/stamping.

A-2.2 Range and Accuracy

The range and accuracy of equipment shall be as follows:

a) Any measuring instrument/equipment shall have range which is 1.5 to 2 times the measured value;
b) Hydrostatic test apparatus in accordance with IS 5844;
c) Weighting equipment error not greater than 0.1 percent;
d) Working pressure gauge error not greater than 1 percent of the pressure; and
e) Master pressure gauge error not greater than 0.25 percent of the full-scale deflection.

A-2.3 Calibration

Calibration of equipment shall be carried out at periods not exceeding the following:

a) *Working pressure gauge* — 1 month;
b) *Master pressure gauge* — 6 months;

c) *Weighing equipment* — checked by test weight daily when in service; and
d) *Test weights* — 2 years or as per the requirements of weight and measure certification, whichever is lesser.

A-3 WORKING CONDITIONS

Working conditions for the test stations shall be conducive to satisfactory, accurate and safe inspection and testing of gas containers. The test station shall comply with the following conditions:

a) It shall have good lighting to permit ready external examination of gas containers, preferably including natural lighting;
b) It shall have adequate ventilation to remove residual gases from containers;
c) The painting area shall also have sufficient ventilation;
d) It shall provide sufficient space to permit safe working;
e) It shall be maintained in a clean dry condition; and
f) It shall have adequate fire safety measures as per the statutory requirements.

A-4 QUALITY MANAGEMENT SYSTEM

The container testing station shall have in quality management system according to IS/ISO 9001 duly certified from Bureau of Indian Standards or any other internationally reputed agency.

NOTE — The test station shall adopt procedures, which fully comply with the requirements of these rules and guidelines issued by statutory authority from time to time.

ANNEX B

(*Clause* 8.2)

DESCRIPTION AND EVALUATION OF DEFECTS, AND CONDITIONS FOR REJECTION OF WELDED CARBON STEEL GAS CONTAINERS AT THE TIME OF VISUAL INSPECTION

B-1 GENERAL

Gas container defects may be physical, material or due to corrosion as a result of environmental or service conditions to which the container has been subjected during its life.

The object of this annex is to provide general guidelines for gas container users on the application of rejection criteria. It is intended, in particular, for gas container users with limited practical experience.

This annex applies to all containers, but those which have contained gases having special characteristics may require modified controls.

Any defect presenting a sharp notch may be removed by grinding, machining or other approved methods. After such a repair, the wall thickness shall be checked, for example, ultrasonically, to ensure that the minimum design wall thickness has been maintained.

B-2 PHYSICAL OR MATERIAL DEFECTS

Evaluation of physical and material defects in the container shall be in accordance with Table 1.

Permanent attachments (for example, foot-rings or shrouds, etc) shall be inspected and shall be suitable for the intended purposes.

B-3 CORROSION

B-3.1 General

The container can be subjected to environmental conditions that could cause external corrosion of the metal. Internal corrosion of the metal can also occur owing to service conditions.

There is difficulty in presenting definite rejection limits in tabular form for all sizes and types of containers and their service conditions. The limits of rejection have been established following considerable field experience.

Extensive experience and judgment are required in evaluating whether containers that have corroded internally are safe and suitable for return to service. It is important that the surface of the metal is cleaned of corrosion products prior to the inspection of the container.

B-3.2 Types of Corrosion

The general types of corrosion are classified as in Table 2.

Table 1 Rejection Limits Relating to Physical and Material Defects in the Container Shell

(*Clauses* 8.2 *and* B-2)

Sl No. (1)	Type of Defect (2)	Definition (3)	Rejection Criteria (4)
i)	Bulge	Visible swelling of the container	All containers with such a defect
ii)	Dent	A depression in the container that has neither penetrated nor removed metal and is greater in depth than 1 percent of the outside diameter	When the depth of the dent exceeds 3 percent of the external diameter of the container or The mean diameter of the dent is greater than one-quarter of the diameter of the container or When the depth of the dent is greater than 1/10 of the mean diameter of the dent NOTE — Dent on a weld shall not be permitted, but flattening (wear) of weld shall not be treated as a dent on the weld. Dent adjacent to the flattened weld shall be treated as a dent on the weld
iii)	Cut or gouge	A sharp impression where metal has been removed or re-distributed and whose depth exceeds 5 percent of the container wall thickness	When the depth of the cut or gouge exceeds 20 percent of the wall thickness or When the length exceeds 75 mm or 25 percent of the outside diameter of the container whichever is less or When the wall thickness is less than the design minimum wall thickness
iv)	Crack	A split or rift in the metal	All containers with such defects
v)	Dig	A sharp depression where the surface material has been penetrated	75mm or more in length and 4mm or more in width or When the depth of the cut or gouge exceeds 20 percent of the wall thickness or When the wall thickness is less than the design minimum wall thickness
vi)	Fire damage	Excessive general or localized heating of container usually indicated by, a) chaming or burning of paint b) distortion of container c) partial melting of container d) other signs of excessive heat damage are evident	All containers in categories (b), (c) or (d). If only (a) is evident, the container may be accepted by a competent person, if the container passes the volumetric expansion test

NOTE — When applying the rejection criteria given in Table 1, the conditions of use of the container, the severity of the defect and safety factors in the design shall be taken into consideration.

Table 2 Rejection Criteria for Corrosion of the Container Wall

(*Clauses* 8.2 *and* B-3.2)

Sl No. (1)	Type of Corrosion (2)	Definition (3)	Rejection Criteria (4)
i)	General corrosion	Reduction in wall thickness over an area of more than 20 percent of container surface area	Rejection in all cases
ii)	Local corrosion	Loss of wall thickness over an area of less than 20 percent of either the interior or exterior total surface area of the container, except for the other types of local corrosion described below	If the depth of penetration exceeds 20 percent of the original thickness of the container wall or If the wall thickness is less than minimum design wall thickness
iii)	Chain pitting or line corrosion	Corrosion forming a narrow longitudinal or circumferential line or strip, or isolated craters or pits which are almost connected	If a total length of corrosion in any direction exceeds the diameter of the container or the depth exceeds 10 percent of the original wall thickness or If the wall thickness is less than minimum design wall thickness
iv)	Isolated pits	Corrosion forming isolated craters, without significant alignment	Depth on any penetration of any pit exceeds 0.4 mm[1]
v)	Crevice corrosion	Corrosion associated with taking place in, or immediately around, an aperture	If, after thorough cleaning, the depth of penetration exceeds 20 percent of the original wall thickness or If the wall thickness is less than minimum design wall thickness

[1] Containers shall be rejected in case the observed thickness of the undamaged remaining wall in the affected portion is less than the minimum calculated wall thickness.

ANNEX C

(*Clauses* 11.1 *and* 18)

TEST REPORT FORMAT

C-1 This annex provides guidance on the range of information to be included in the documentation associated with retesting of container. Example of suitable format is provided below. Other formats are also acceptable. Each report shall be signed by the retester.

Name and address of the retesting station ____________________

____

____

Name of the container manufacturer ____________________

Name and address of the container owner ____________________

____

____

Container Description:

Report No. Date __________

Manufacturing standard IS __________ Outside diameter __________ mm

Container serial number __________ Vehicle registration plate detail __________

Guaranteed minimum wall thickness __________ mm

Maximum working pressure __________ Test pressure __________

Water capacity marked on container __________ litre

Tare weight marked on the container __________ kg

Date of original hydrostatic/hydrostatic stretch test of container __________

Container thread type __________ its condition __________ and

Conformation with gauge __________

Weight

Present tare weight __________ kg

Difference in present tare weight and tare weight marked on the container __________ kg

Pass/Fail __________

External Examination

Pass/Fail __________

Reason of rejection ____________________

Internal Examination

Pass/Fail __________

Reason ____________________

Hydrostatic Test at 3 MPa

Pass/Fail __________

Reason of rejection____________________

Actual water capacity __________ litre

Actual weight __________ kg

Variation in tare weight that is weight marked on the container and actual weight ______________________ kg

Container actual wall thickness _________________ mm

Test reports and certificates furnished by the manufacturer, if available

Detail of valve fitted on the container

Make ___________________________

Type ___________________________

Thread condition _________________

Remarks ____

____

Supervisor's name and signature ___________________________

Approved by: Name, designation and signature ___________________________

Place __________________________ Date ___________________________

Seal of the organization

ANNEX D

(*Clause* 13.2)

PRESSURE RELIEF DEVICE (PRD) INSPECTION

D-1 GENERAL

The LPG container for automotive use is equipped with a multifunction valve with a PRD. All PRDs shall be in direct communication with the contents (vapour phase) of the container, regardless of whether the container valve is open or closed.

D-2 REQUIREMENTS

a) External inspection of PRD(s) for corrosion damage, plugging of the PRD vent system and mechanical defects, such as leakage, extrusion of fusible metal or looseness of attachments. This shall be done each time, and

b) Leak testing of all connection between the valve and container port, and the plug PRD(s) and container port. All PRD connections and the valve shall be checked for leakage, These connections shall be serviced if any leakage from these areas is deleted.

D-3 APPROVED EQUIPMENT

The inspector shall verify that the PRD(s) in use with the container is (are) approved and specified by the manufacturer for the container type.

D-4 REPLACEMENT

Once removed, PRDs shall not be installed on any other container but may, if they are appropriate and pass inspection, be reinstalled on the same container from which they were removed, as recommended by the container manufacturer.

ANNEX E
(*Foreword*)

COMMITTEE COMPOSITION

Gas Cylinders Sectional Committee, MED 16

Organization	*Representative*(*s*)
Petroleum and Explosive Safety Organization, Nagpur	Shri T. R. Thomas (***Chairman***) Shri D. K. Gupta (*Alternate*)
All India Industrial Gases Manufacturers Association, New Delhi	Shri Saket Tiku Shrimati Veena Peter (*Alternate*)
Bharat Petroleum Corporation Limited, Mumbai	Shri J. Vedagiri Shri Sanjay Phulli (*Alternate*)
Bharat Pumps and Compressors Limited, Allahabad	Shri Mohan Kumar Shri P. G. Choudhury (*Alternate*)
BOC India Limited, Kolkata	Shri K. Manoharan Shri Ramana Vutukuru (*Alternate*)
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Indian Oil Corporation Limited, Mumbai	Shri Shankar Sharan Shri S. M. Rambhal (*Alternate*)
Indraprastha Gas Limited, New Delhi	Shri Praveen K. Pandey Shri Ujwal Bhandari (*Alternate*)
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Kabsons Gas Equipments Limited, Hyderabad	Shri Satish Kabra Shri S. GopalAiah (*Alternate*)
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LPG Equipment Research Centre, Bangalore	Shri U. V. Mannur Shrimati Karobi Mukherjee (*Alternate*)
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Maruti Koatsu Cylinders Limited, Mumbai	Shri Nitin J. Thakkar Shri A. S. Saran (*Alternate*)
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Organization	*Representative*(*s*)
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The Automotive Research Association of India, Pune	Dr S. S. Thipse Shri S. D. Rairikar (*Alternate*)
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Vanaz Engineers Limited, Pune	Shri S. R. Sarvate Shri S. J. Vispute (*Alternate*)
In personal capacity (*Menon and Patel, 14/1, Mile, Mathura Road, Faridabad*)	Shri Ebrahim M. Patel
In personal capacity (*303, Shantikunj, Pandav Bunglows Lane Athwalines, Surat*)	Shri L. D. Thakkar
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Member Secretary
Shri Vishal Tomer
Scientist 'C' (MED), BIS

Composition of Low Pressure Gas Cylinders Sub-committee, MED 16 : 2

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All India Industrial Gases Manufacturers Association, New Delhi	Shri Saket Tiku Shrimati Veena Peter (*Alternate*)
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Tata Iron and Steel Company Limited, Jamshedpur	Shri Sudipto Sarkar Dr A. N. Bhagat (*Alternate*)

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This Indian Standard has been developed from Doc No.: MED 16 (1158).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Published by BIS, New Delhi